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tracheal and bronchial rings — arise from the seventh visceral (fifth branchial) arch, and that the laryngeal muscles arise from the musculature of the same arch. In the same number of the journal, Hochstetter continues his researches on the blood vessels, this time discussing the arteries of the alimentary canal. Bolk describes an abnormal condition in the shorter head of the biceps femoris muscle of the orang, and discusses its bearings upon the morphology of this muscle. Maurer describes the vacuolization of the epidermis of the anura at the time of metamorphosis, while Gegenbaur has some remarks upon anatomical nomenclature, urging the retention of personal names as a guide to the history of the subject, as well as considering the terminations -ideus or -oides.

BOTANY.

A New Text-book on Fossil Plants.[1] — Of late years an increasing interest in the study of plant-fossils has been developed among botanists, especially with reference to the bearing of these fossil remains upon the origin of existing plants.

The great importance of a thorough knowledge of fossil plants in the study of the evolution of plant forms is sufficiently obvious; but, unfortunately, much of the descriptive work upon fossil plants has been done by men who were not botanists, and whose knowledge of living plants was of the slightest. This fact has helped to discredit much of the work in paleobotany, and a great deal of really important work has not, perhaps, received the attention it deserved. There is at present almost hopeless confusion in the nomenclature of fossil plants, names having frequently been given to unrecognizable fragments of more than dubious autonomy, and often enough shown later not to be plant remains at all. It is most encouraging then when we find trained botanists entering the field; men who are really competent to interpret the specimens with which they have to deal, and not so much interested in adding to the already overgrown list of doubtful fragments as in doing something to throw light upon the real affinities of the forms already described.

Professor Seward's thorough training, both as botanist and geologist, has prepared him admirably for the task he has set himself, and it must be admitted that he has acquitted himself in a most satisfactory manner. Both the botanist and geologist will find his work of the greatest value — quite indispensable, indeed, in a study of the fossil flora of the earth.

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[1] Seward, A. C., M.A., F.R.S. *Fossil Plants*, vol. i. Cambridge, University Press, 1898.

The rich collections of the British Museum, as well as other great collections in Britain and elsewhere, have furnished the author with a great mass of valuable materials, of which he has made most excellent use.

The first three chapters of the present volume comprise, first, a comprehensive sketch of the development of the science of paleobotany; a chapter on the relation of paleobotany to botany and geology; and an extremely clear account of the succession and limits of the principal geological periods. A most interesting chapter follows, dealing in a striking way with the factors concerned in the preservation of plant remains. As plants are for the most part destitute of skeletal tissues, except wood, it is not surprising that they have left relatively few remains when compared with animals. This is especially the case among the lower non-vascular plants. Many interesting illustrations are given to show how the process of fossilization is going on at the present day. One of the most striking is the description of the great masses, or rafts of vegetation, drifted out to sea from the mouths of large rivers, like the Mississippi or Amazon. The harder and less perishable structures, like the trunks of trees, and hard seeds or fruits, finally sink to the bottom of the sea, often hundreds of miles away from their original habitat, and, gradually buried in the sediment at the bottom, may in future ages appear as fossils, mingled with various marine forms. It is probable that the occurrence of terrestrial, or fresh-water organisms in fossil beds of marine origin is to be accounted for in this manner.

It is rather startling to learn that not only may such structures as the cuticle and cell walls of the epidermis be preserved, but that delicate parenchyma cells with traces of the contained protoplasm and nuclei can occasionally be recognized in a fossil condition! The most perfect fossils are those in which there has been an infiltration of silicious matter, and such petrifactions often have the tissues so perfectly preserved that microscopic sections reveal most beautifully the details of the cellular structure. It is the study of such sections that has done more, perhaps, than anything else to explain the real affinities of the plants in question.

Chapter V deals with the difficulties and sources of error encountered in dealing with fossil plant remains, and shows how cautious the investigator must be in drawing conclusions from mere impressions, no matter how clear they may be. The extraordinary external resemblances between unrelated forms is shown by a number of illustrations; *e.g.*, Equisetum, Casuarina, Ephedra.

The second part of the volume is systematic and deals with the fossil forms from the lowest plants, Bacteria and Schizophyceæ, and other simple unicellular organisms, and comprises the Algæ, Fungi, Mosses, and part of the Pteridophytes.

Among the lowest forms, as might be expected, fossils are comparatively few, and often of more than doubtful authenticity. Nevertheless, there are evidences of the existence of Bacteria and blue-green Algæ in very old formations, although in most cases these evidences consist rather in the results of their growth than in the presence of the organisms themselves, *e.g.*, calcareous nodules formed by Cyanophyceæ, partially decomposed tissues attacked by Bacteria.

Among the Algæ, only such forms as have a calcareous or silicious skeleton have left fossils whose nature is unmistakable. Professor Seward is very cautious about accepting the validity of many such doubtful forms as the so-called "Fucoids," for instance, which are merely impressions of extremely doubtful character. There are, however, very perfect fossils whose algal nature is perfectly evident. Of these, the Diatoms, the calcareous Coralline Algæ or "Nullipores," and the calcareous green Algæ, belonging to the Characeæ and Siphoneæ, are the best known. The latter group and the Corallines have played an important part in the formation of certain limestones. As at the present day, in the warmer seas, they grew about the coral reefs which owe their growth to no inconsiderable degree to the activity of these calcareous Algæ. According to Professor Seward, there are reliable evidences of the existence of Corallines as far back as the upper Cambrian and lower Silurian, and the calcareous Siphoneæ were evidently abundant in the ancient seas. The Diatoms are a much more recent development, and no certain evidences of their existence have been found below the secondary formations.

The true Phæophyceæ, or brown Algæ, never develop a calcareous or silicious skeleton, and have left practically no fossil remains that are certainly recognizable. Many casts from the older formations have been attributed to Algæ of this group, but these casts are usually of very doubtful origin. The most probable remains of Phæophyceæ belong to the genus Nematophycus, from Devonian and Silurian deposits. This genus shows some evidences of a structure comparable to that of the existing giant kelps, like Lessonia or Macrocystis. Remains of Fungi and Mosses are too scanty and imperfect to throw much light upon the geological history of these two groups of plants.

Space will not permit of more than a reference to the rest of the contents of the volume in hand. Of the Pteridophytes, the Equisetineæ are fully and clearly treated, and the volume concludes with an account of the genus Sphenophyllum, which is considered to be the type of a class, Sphenophyllales, coördinate with the other phyla of the Pteridophytes. A full bibliography and index complete the volume.

The work may be recommended unqualifiedly as a thoroughly reliable and clear presentation of a most interesting and important subject. It is to be hoped that the second volume may be soon before us.

Douglas Houghton Campbell.

Illustrierte Flora von Deutschland. — The eighteenth revised edition of Garcke's German flora is now at hand. This admirable work is too well known to need description. The new edition, although embodying many minor corrections in keys, plant ranges, etc., maintains in all more important matters the same form as the edition of 1895. Like this, it is illustrated by some 760 block cuts, scattered in the text. These figures, although in some cases a trifle stiff and wooden in general appearance, are very clear and accurate in detail. The work is more than ordinarily interesting to Americans from a sort of parallelism with Dr. Gray's well-known *Manual of Botany*. Both were first issued in 1848, and have alike, in successive editions, received repeated and painstaking revision by their authors. Both follow the De Candollean arrangement of families and what is now regarded as a conservative nomenclature. Both italicize distinctive characters, scatter their specific keys through the text, cite authorities and important synonyms, but omit all bibliography. Both have been exceptionally useful books and still enjoy wide popularity.

The German work describes 718 genera and 2614 species of vascular plants. Its introductory key, still based upon the classes and orders of Linnæus, seems something of an anachronism, but is skillfully managed and certainly lucid. A feature of questionable taste is the use of authorities after vernacular family names. Such expressions as "Campanulaceen Juss.," "Compositen Adans.," and the like, are, it is true, not seriously misleading, yet they are, strictly speaking, inaccurate and therefore to be avoided. B. L. R.